Wait, did I forget my network?

Analyzing the Role of Weapons in the Precision Engagement Pillar of Network Centric Warfare

J. Bryan Lail, 520-794-2727
jblail@raytheon.com
Raytheon Missile Systems

What is Network Centric Warfare?

Raytheon

An information superiority-enabled concept of operations that generates increased combat power by networking sensors, decision ma rs to achieve shared awar d speed of command, higher tempo of operations, greater lethality, increased survivability, and a degree of self-synchronization

- **C4ISR Cooperative Research Program, Sep 02**

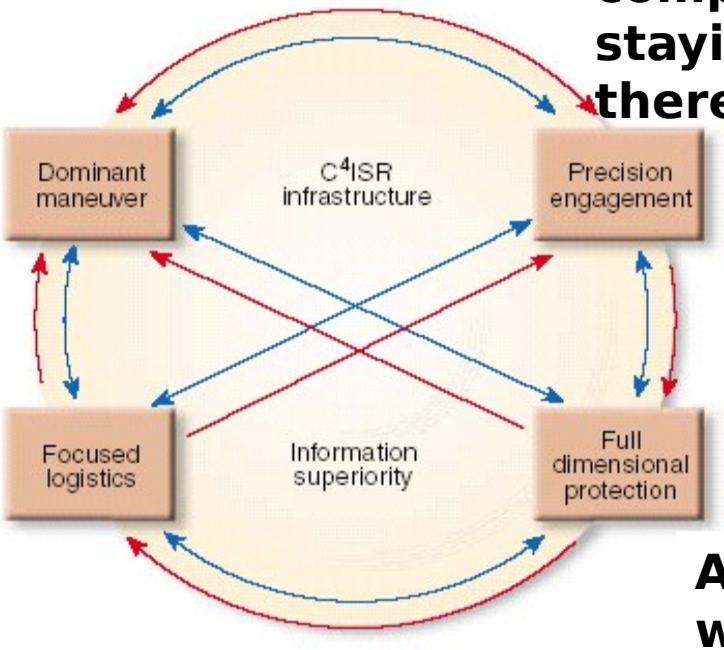
Whither Weapons?

NCW translates information superiority into "effects-based" combat power by effectively linking knowledgeable entities in the battlespace and enabling a new way of fighting wars

Definitions

Raytheon

Network Centric Warfare is a *method* for performing the whole kill chain with a completely new C² doctrine, resulting in staying inside the enemy's OODA loop and therefore more efficient warfighting

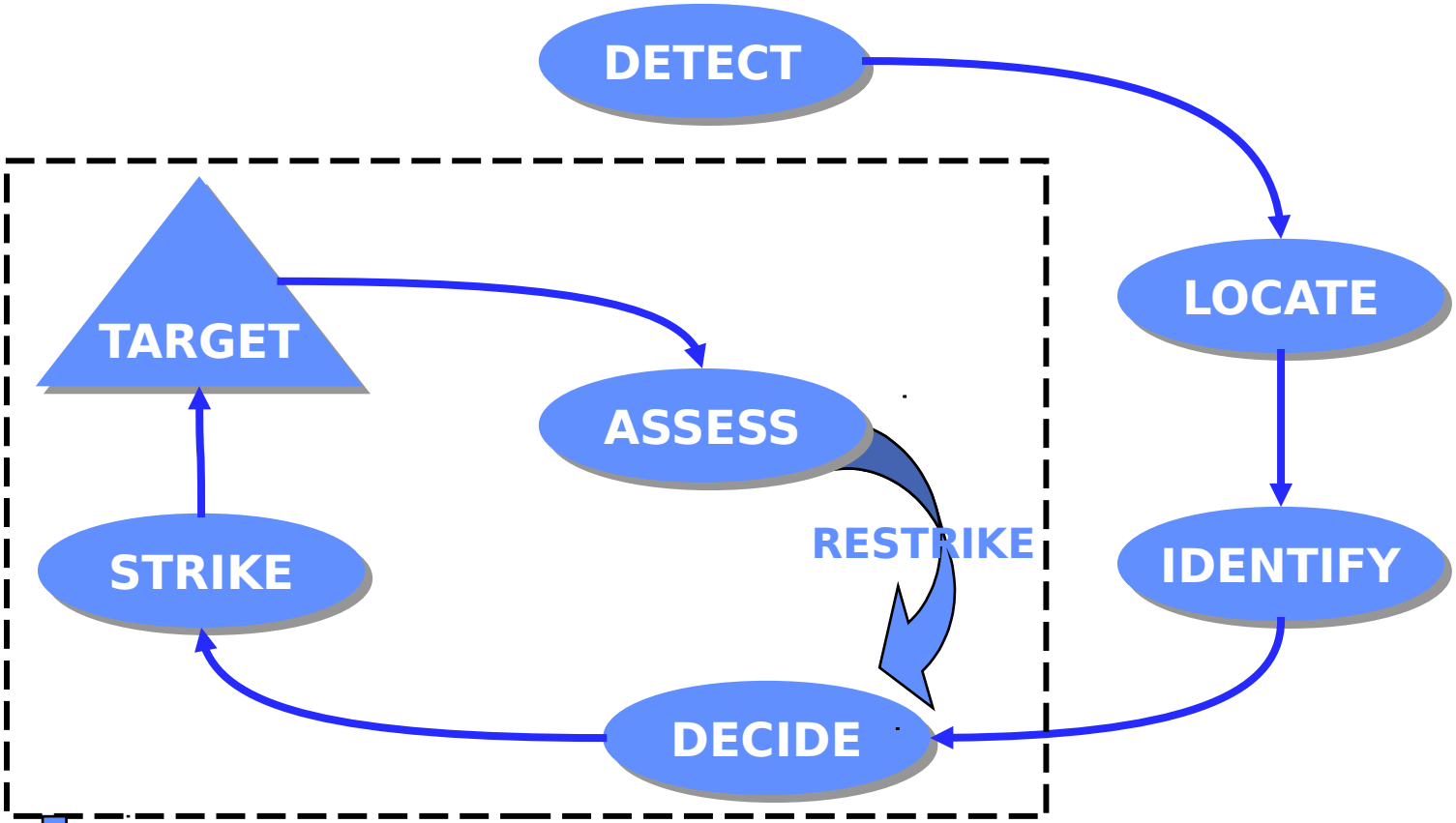


Precision Engagement is a component of achieving NCW, requiring thorough tradeoffs & study across the kill chain

A Concept of Operations is how the whole warfighting kill chain *can* viably work, whe analysis can help determine the *best* CON

Effects-Based Warfare focuses on military applications for shaping behavior (friend and foe), where network centric warfare (the means) combined with technology (the enabler) can provide incredible new *ways* to provide that shaping quickly and overwhelmingly.

Time-Sensitive Targeting Process*



Allocation to lower C^2 units with shared battlespace awareness

- **Perform manned/unmanned strike missions more like ground units†,**
- **with authority to prosecute a battlespace within doctrinal/ROE limits**

*** JP 3-60 Joint Doctrine for Targeting, 17 Jan 02 † i.e. Army Compar**

Raytheon

Toolset for Warfighter-focused Capability

- **Assist in configuring/implementing *joint* battlespace**
- **Provide a tactics development/experiment capability**
  - **Provide *operator-in-the-loop* by linking platform, BM/C², communications, mission planning, and weapon centers**
  - **Represent varying levels of ROE, decision nodes and timelines, sensor fusion, and *effects* of synchronization**
- **Demonstrate and test *how* Doctrine, Organization, and Training (DOT) changes are enabled by new weapon system concepts**

DOT = Tech ?

DOT ≥ Tech ?

Raytheon

What are the roles of weapons in NCW?

- **Destroy/Disable critical enemy information age capabilities**
  - **Enemy's ability to coordinate between nodes and/or hit us asymmetrically through attacking our networks/comms**
- **Contribute to knowledge on the warfighter network* - "L^5"**
  - **Long range (anti-access), Loitering (persistence), Linked (data from weapon), Looking (searching seeker), Labeling (identification)**
- **Respond to improvements in the warfighter network**
  - **Agile design and employment capability (retargeting weapon)**
  - **Enable tactics improvements by warfighter *through* flexibility**
- **Provide cost effective inventory that mitigates the concerns about "overlap" with shared battlespace awareness**
  - **Given greatly reduced fratricide, assess trade between "wasted weapons" vs. "better target prosecution" and IOC date**
- **Weapon Data Terminals (WDT), Searching Seekers, and such technologies are the infostructure "entry fee" for weapon systems to enter into the Information Age, not the final effect!**

* **Further enabled by "S^3" – Speed, Survivability, and Sensor-linked cueing**

Raytheon

What functionality/tools do we need?

- **Finding the "right" C^2 solution is very challenging**
  - **Represent the varying functionality and effect of future solutions, allowing the insertion of high fidelity C^2 sims**
  - **Assess Command and "Coordination" instead of "Control"**
- **Tools must be capable of assessing tactics changes**
  - **Network-enabled tactics changes are the *real* effects boost**
  - **Operator-in-the-loop tactics development**
- **Tools for future weapon concept representation**
  - **Weapon systems as contributors to PBA**
  - **L^5, Speed, and Smaller weapons to "carry more"**
  - **Impact of varying SA on weapon effectiveness**
  - **Operator-in-the-loop for C^2 and other MITL functions**

Smart Autonomous w/2-way WDT, Searching Seeker
Provide RT SA during Loiter, Decide to Attack, BDI

Trade Space

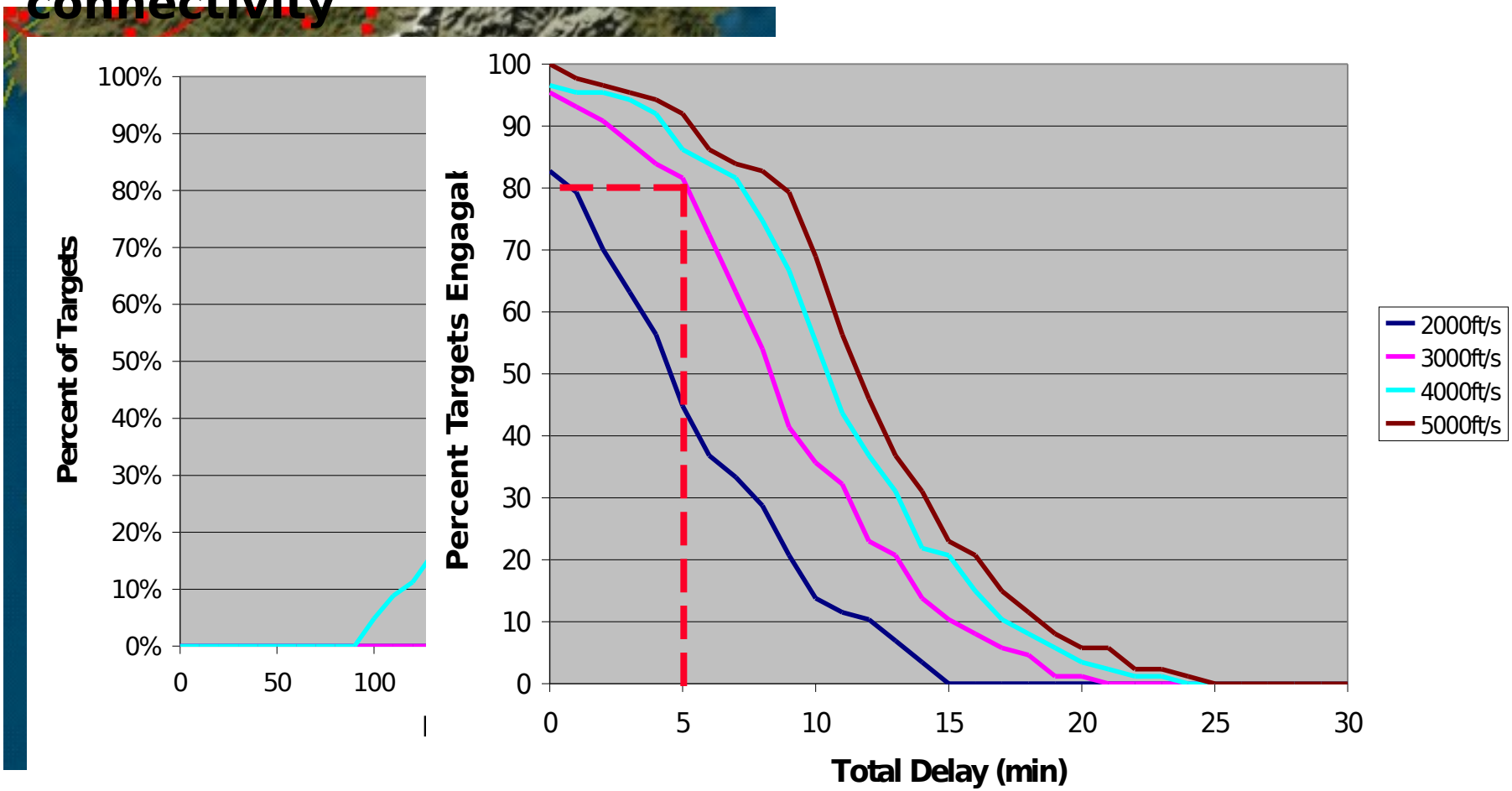
Dumb Weapon with
forward link termina

Modeling Requirements

Raytheon

Priority #1 – Analyst-friendly requirements analysis tool

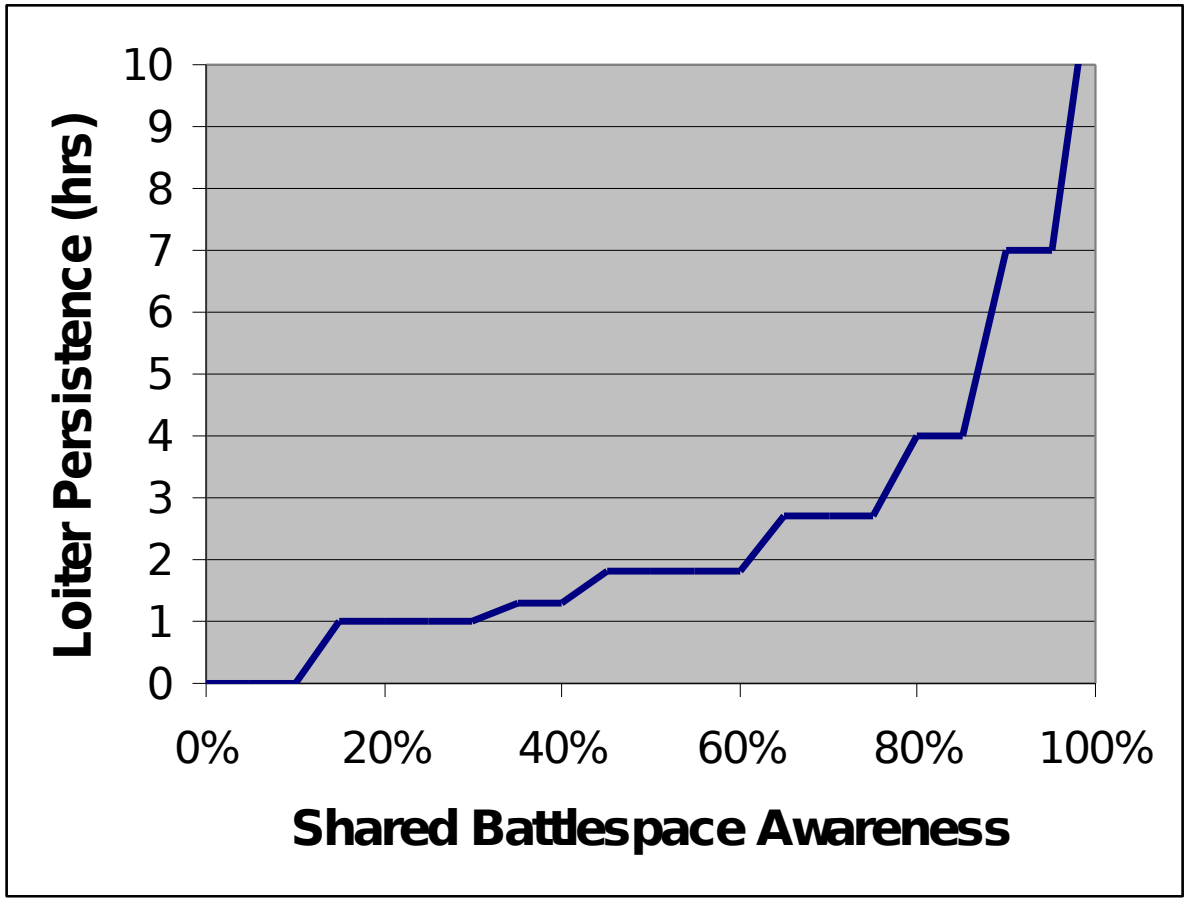
- Parameterize sensor/launcher placement, timelines, connectivity



Constructive Modeling

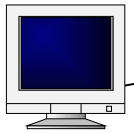
Priority #2 – Campaign model improvements for NCW

- Requires a model that can be easily

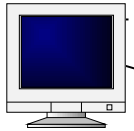


Distributed Testbeds

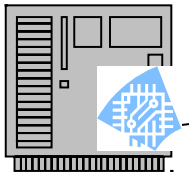
Raytheon



Force on Force Models



Engineering Models (6 Dof)



Hardware in the Loop

HLA / DIS

Simulation Interoperability Tool Kit

Generic Missile Server

Exercise Management System

Scenario Development

Data Collection Reduction

Visualization Global Hi - Res 3D

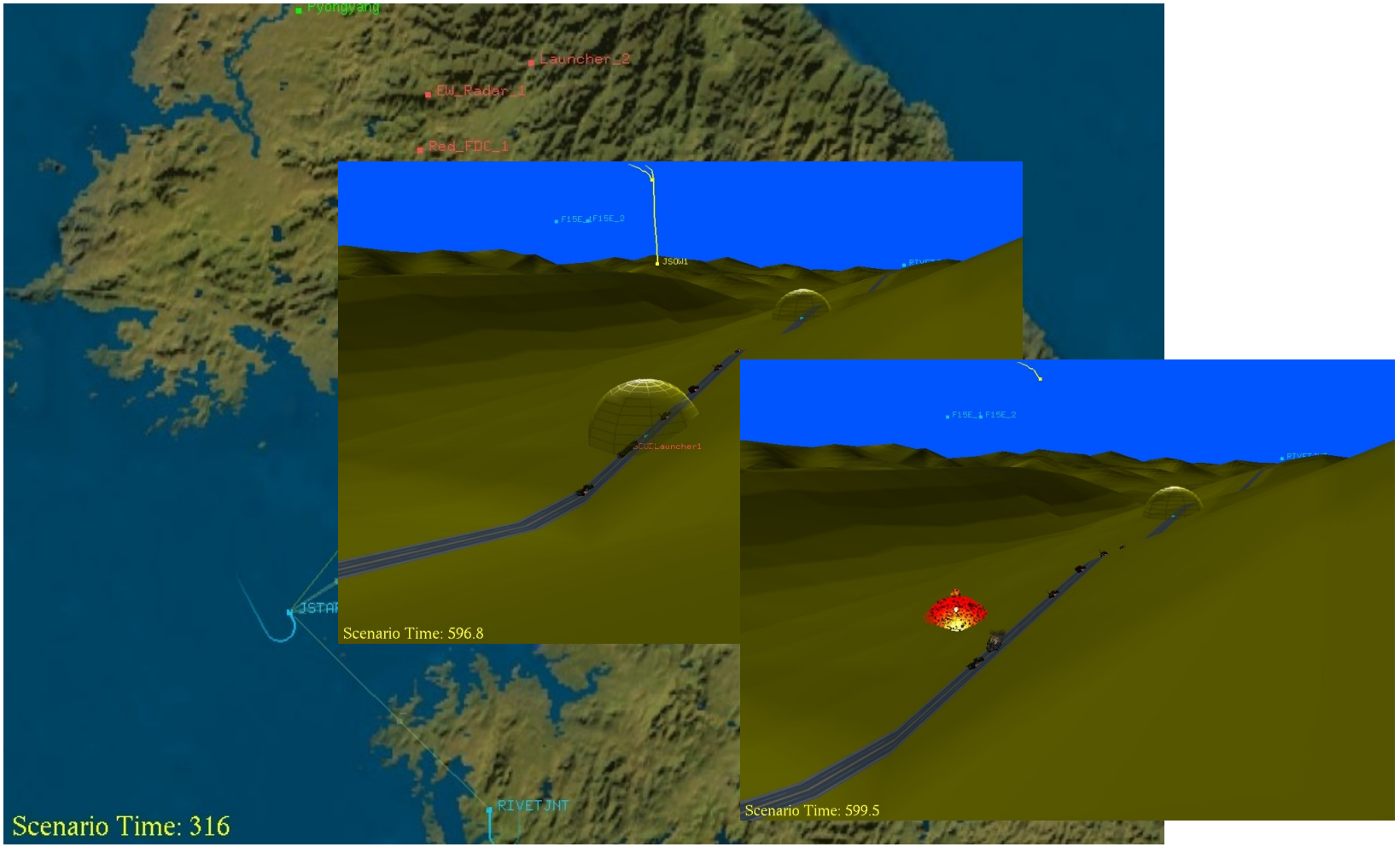
External Links
- to anywhere required, given compatible protocols

Distributed Testbeds

Raytheon

- **Distributed testbeds *are* a method to simulate the breadth of the strike kill chain with each "piece" coming from anywhere and in any *compatible* form (Live test event, HITL, Engineering Simulation)**
- **Distributed testbed applications include:**
  - **CONOPS Demonstration and *Development***
  - **Kill Chain *Analysis* at any level of fidelity required**
  - **Simulation-Based Acquisition (Warfighter/ITL Testing)**
  - **Training the warfighter to help them develop requirements**
- ***Same* core capability is used for demonstration, experimentation, concept proof, and DT/OT**
  - **System Analysis/Experiment, OFP Testing/Deployment**
- **A distributed testbed is *not* a campaign tool or a *replacement* for specialized constructive models**

Testbed Performance Prediction



See Interactive Visualization from Distributed Simulation Run (Strike_Testbed_Mar03.mov)

Movie Demo – Future of Testbeds

Raytheon

See Unmanned Airborne Weapon System Movie Demonstration (Strike_Testbed_Future.mov)

Are you *SURE* the target is 20ft *below* sea level?

- **Most of the right basic tools exist**
  - **They aren't *yet* being used efficiently and directed for growth towards supporting the warfighter in experimenting and defining requirements for netcentric operations**

- **The future of net-centric toolsets is in distributed testbeds linked to models with capability to assess NCW "means" to effects-based warfare**